AMENDMENTS TO THE SPECIFICATION

IN THE TITLE OF THE INVENTION:

Please delete the title in its entirety and replace therefor --METHOD FOR PRODUCING TRANSGENIC PLANTS RESISTANT TO WEED CONTROL COMPOUNDS WHICH DISRUPT THE PORPHYRIN PATHWAYS OF PLANTS--.

IN THE ABSTRACT OF THE DISCLOSURE:

Replace the Abstract of the Disclosure currently of record with the attached new Abstract of the Disclosure.

IN THE SPECIFICATION:

Before line 1 of the specification **(after the Title)**, please insert the following new paragraph:

This application is a Continuation-In-Part of co-pending Application No. 09/302,357, filed on April 30, 1999, and for which priority is claimed under 35 U.S.C. § 120; and this application claims priority of Application Nos. 120553/1998, 281127/1998, 330981/1998, and 054730/1999 filed in Japan on April 30, 1998, October 2, 1998, November 20, 1998, and March 2, 1999, respectively, under 35 U.S.C. § 119; the entire contents of all are hereby incorporated by reference.

Please amend the paragraphs beginning on page 16, line 8 and continuing to page 48, line 18 as follows:

BRIEF SUMMARY OF THE INVENTION ~~INVENITON~~

One aspect of the present invention relates to a ~~1. A~~ method for giving weed control compound-resistance to a plant which comprises the steps of:

introducing a gene encoding a protein having the following characteristics (a) to (c):

(a) having a specific affinity for a substance which is concerned with the weed control activity of a weed control compound,

(b) having substantially no capability of modifying a substance for which said protein has a specific affinity, and

(c) being substantially free from framework regions of variable regions in an immunoglobulin,

into a plant cell; and

expressing the gene (hereinafter referred to as the first aspect of the method of the present invention).

~~2.~~ The present invention also relates to a method according to the above ~~1~~, wherein the gene is introduced into the plant cell

in the form that it is operably ligated to a promoter and a terminator both of which are functional in the plant cell;~~.~~

~~3.~~ The method according to the above ~~1 or 2~~, wherein the substance which is concerned with the weed control activity of the weed control compound is the weed control compound itself;~~.~~

~~4.~~ The method according to the above ~~1 or 2~~, wherein the substance which is concerned with the weed control activity of a weed control compound is an endogenous substance in a plant;~~.~~

~~5.~~ The method according to the above ~~1 or 2~~, wherein the weed control compound is that inhibiting porphyrin biosynthesis of a plant;~~.~~

~~6.~~ The method according to the above ~~1 or 2~~, wherein the weed control compound is a protoporphyrinogen IX oxidase inhibitory-type herbicidal compound;~~.~~

~~7.~~ The method according to the above ~~5 or 6~~, wherein the substance which is concerned with the weed control activity of the weed control compound is protoporphyrin IX;~~.~~

~~8.~~ The method according to the above ~~5 or 6~~, wherein the protein is protoporphyrin IX binding subunit protein of magnesium chelatase, or a variant of said protein having a specific affinity for protoporphyrin IX;~~.~~

~~9.~~ The method according to the above ~~8~~, wherein the protein is magnesium chelatase derived from a photosynthetic microorganism;~~.~~

~~10.~~ The method according to the above ~~8~~, wherein the protein is magnesium chelatase derived from a plant;~~.~~

~~11.~~ The method according to the above ~~8~~, wherein the protein is magnesium chelatase derived from tobacco;~~.~~

~~12.~~ The method according to the above ~~5 or 6~~, wherein the protein comprises the amino acid sequence of SEQ ID NO: 53;~~.~~

~~13.~~ The method according to the above ~~5 or 6~~, wherein the protein has the amino acid sequence of SEQ ID NO: 54;~~.~~

~~14.~~ The method according to the above ~~5 or 6~~, wherein the protein comprises the amino acid sequence of SEQ ID NO: 55;~~.~~

~~15.~~ The method according to the above ~~5 or 6~~, wherein the protein has the amino acid sequence of SEQ ID NO: 56;~~.~~

~~16.~~ The method according to the above ~~5 or 6~~, wherein the protein comprises the amino acid sequence of SEQ ID NO: 57;~~.~~

~~17.~~ The method according to the above ~~5 or 6~~, wherein the protein has the amino acid sequence of SEQ ID NO: 58;~~.~~

~~18.~~ The method according to the above ~~5 or 6~~, wherein the protein comprises the amino acid sequence of SEQ ID NO: 59;~~.~~

~~19.~~ The method according to the above ~~5 or 6~~, wherein the protein has the amino acid sequence of SEQ ID NO: 60;~~.~~

~~20.~~ The method according to the above ~~5 or 6~~, wherein the protein is composed of 4 to 100 amino acids;~~.~~

~~21.~~ The method according to the above ~~5 or 6~~, wherein the substance which is concerned with the weed control activity of the weed control compound is protoporphyrinogen IX;~~.~~

~~22.~~ The method according to the above ~~5 or 6~~, wherein the protein is a variant of protoporphyrinogen IX oxidase having no capability of oxidizing protoporphyrinogen IX and having a specific affinity for a protoporphyrinogen IX;~~.~~

~~23.~~ The method according to the above ~~5 or 6~~, wherein the protein is a variant of protoporphyrinogen IX oxidase having no capability of oxidizing protoporphyrinogen IX and having a specific affinity for a protoporphyrin IX oxidase inhibitory-type herbicidal compound;~~.~~

~~24.~~ The method according to the above ~~22 or 23~~, wherein the protein is a variant of protoporphyrinogen IX oxidase derived from a plant;~~.~~

~~25.~~ The method according to the above ~~22 or 23~~, wherein the protein is a variant of protoporphyrinogen IX oxidase derived from soybean;~~.~~

~~26.~~ The method according to the above ~~22 or 23~~, wherein the protein is a variant of protoporphyrinogen IX oxidase derived from an algae; and~~.~~

~~27.~~ The method according to the above ~~22 or 23~~, wherein the protein is a variant of protoporphyrinogen IX oxidase derived from Chlamydomonas.

Another aspect of the present invention relates to a ~~28. A~~ method for giving weed control compound-resistance to a plant which comprises the steps of:

introducing a gene encoding a protein having the following characteristics (a) to (c):

(a) having a specific affinity for protoporphyrin IX,

(b) having substantially no capability of modifying protoporphyrinogen IX, and

(c) being substantially free from framework regions of variable regions in an immunoglobulin, into a plant cell; and

expressing the gene (hereinafter referred to as the second aspect of the method of the present invention).

~~29.~~ The present invention also relates to a method according to the above ~~28~~, wherein the gene is introduced in the plant cell in the form that it is operably ligated to a promoter and a terminator both of which are functional in the plant cell;~~.~~

~~30.~~ The method according to the above ~~28 or 29~~, wherein the weed control compound is that inhibiting porphyrin biosynthesis of a plant;~~.~~

~~31.~~ The method according to the above ~~28 or 29~~, wherein the weed control compound is a protoporphyrinogen IX oxidase inhibitory-type herbicidal compound;~~.~~

~~32.~~ The method according to the above ~~30 or 31~~, wherein the protein is magnesium chelatase or a variant of said protein having a specific affinity for protoporphyrin IX;~~.~~

~~33.~~ The method according to the above ~~30 or 31~~, wherein the protein is ferrochelatase or a variant of said protein having an specific affinity for protoporphyrin IX;~~.~~

~~34.~~ The method according to the above ~~30 or 31~~, wherein the protein is ferrochelatase derived from a plant;~~.~~

~~35.~~ The method according to the above ~~30 or 31~~, wherein the protein is ferrochelatase derived from barley;~~.~~

~~36.~~ The method according to the above ~~30 or 31~~, wherein the protein is ferrochelatase derived from cucumber; and~~.~~

~~37.~~ The method according to the above ~~30 or 31~~, wherein the protein is a peptide composed of 4 to 100 amino acids.

Another aspect of the present invention relates to a ~~38. A~~ method for giving weed control compound-resistance to a plant which comprises the steps of:

introducing a gene encoding a protein having the following characteristics (a) to (c):

(a) having a specific affinity for protoporphyrinogen IX,

(b) having the capability for modifying coproporphyrinogen III, and

(c) being substantially free from framework regions of variable regions in an immunoglobulin, into a plant cell; and

expressing the gene (hereinafter referred to as the third aspect of the method of the present invention).

~~39.~~ The present invention also relates to the method according to the above ~~38~~, wherein the gene is introduced into the plant cell in the form that it is operably ligated to a promoter and a terminator both of which are functional in the plant cell;~~.~~

~~40.~~ The method according to the above ~~38 or 39~~, wherein the protein is coproporphyrinogen III oxidase or a variant of said protein having a specific affinity for protoporphyrinogen IX;~~.~~

~~41.~~ The method according to the above ~~38 or 39~~, wherein the protein is coproporphyrinogen III oxidase derived from a microorganism;~~.~~

~~42~~ The method according to the above ~~38 or 39~~, wherein the protein is coproporphyrinogen III oxidase derived from Escherichia coli;~~.~~

~~43.~~ A weed control compound-resistant plant whose resistance is given by the method of the above ~~1, 2, 28 or 29~~;~~.~~

~~44.~~ A weed control compound-resistant plant whose resistance is given by the method of the above ~~38 or 39~~;~~.~~

~~45.~~ A method for protecting a plant which comprises applying the weed control compound to a growth area of the plant of the above ~~43~~;~~.~~

~~46.~~ A method for protecting a plant which comprises applying the weed control compound to a growth area of the plant of the above ~~44~~;~~.~~

~~47.~~ A method for selecting a plant which comprises applying a weed control compound to which the plant of the above ~~43~~ is resistant to a growth area of the plant of the above ~~43~~ and other plants, and selecting either plant on the basis of difference in growth between the plants;~~.~~

~~48.~~ A method for selecting a plant which comprises applying a weed control compound to which the plant of the above ~~44~~ is resistant to a growth area of the plant of the above ~~44~~ and other plants, and selecting either plant on the basis of difference in growth between the plants;~~.~~

~~49.~~ The method according to the above ~~47~~, wherein the plants are plant cells;~~.~~

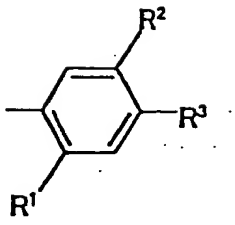
~~50.~~ The method according to the above ~~48~~, wherein the plants are plant cells;~~.~~

~~51.~~ The method according to the above ~~1 or 2~~, wherein the weed control compound is a protoporphyrinogen IX oxidase inhibitory-type herbicidal compound selected from the compounds of (1) to (3) below, and the substance which is concerned with the weed control activity of the weed control compound is protoporphyrin IX, protoporphyrinogen IX or a protoporphyrinogen IX oxidase inhibitory-type herbicidal compound:

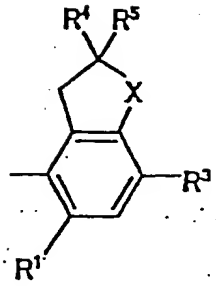
(1) chlormethoxynil, bifenox, chlornitrofen (CNP), acifluorfen (5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitorobenzoic acid) and its ethyl ester, acifluorfen-sodium, oxyfluorfen (2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-trifluoromethylbenzene), oxadiazon (3-[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2(3H)-

one), 2-[4-chloro-2-fluoro-5-(prop-2-ynyloxy)phenyl]-2,3,4,5,6,7-hexahydro-1H-isoindol-1,3-dione, chlorphthalim (N-(4-chlorophenyl)-3,4,5,6-tetrahydrophtalimide), TNPP-ethyl (ethyl 2-[1-(2,3,4-trichlorophenyl)-4-nitropyrazolyl-5-oxy]propionate), or N3-(1-phenylethyl)-2,6-dimethyl-5-propyonylnicotinamide;

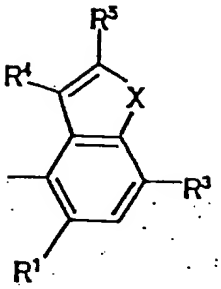
(2) a compound represented by the general formula: J-G (I), wherein G is a group represented by any one of the following general formulas G-1 to G-9 and J is a group represented by any one of the following general formulas of J-1 to J-30:



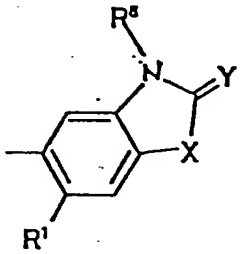
G-1



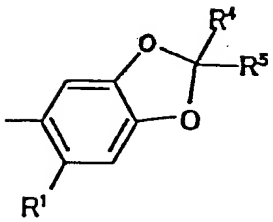
G-2



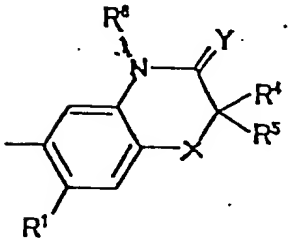
G-3



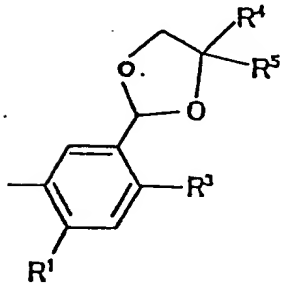
G-4



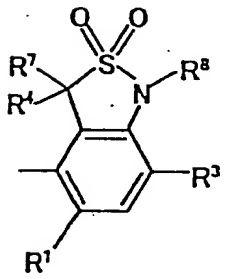
G-5



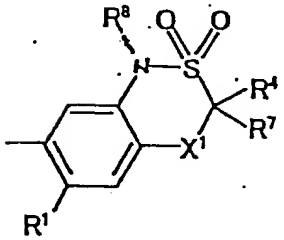
G-6



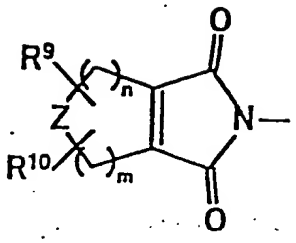
G-7



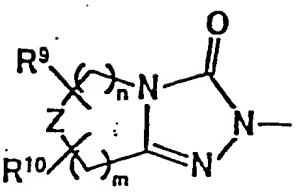
G-8



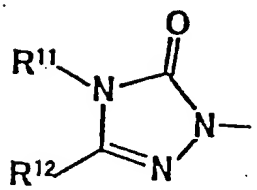
G-9



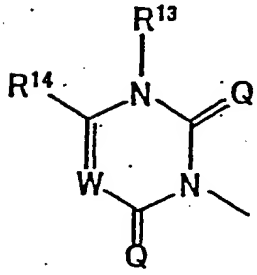
J-1



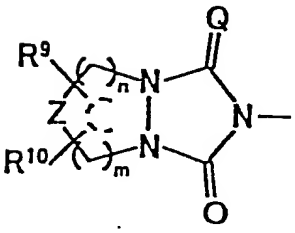
J-2



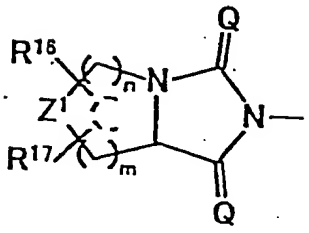
J-3



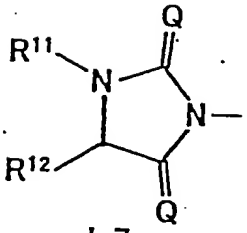
J-4



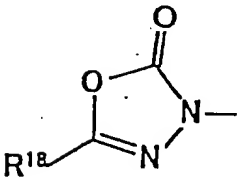
J-5



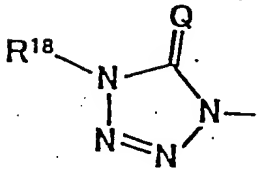
J-6



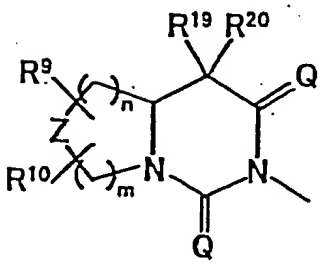
J-7



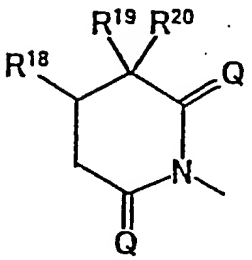
J-8



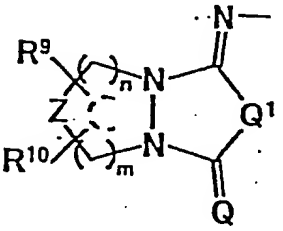
J-9



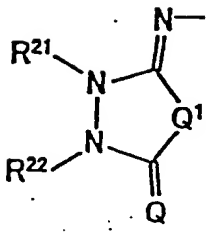
J-10



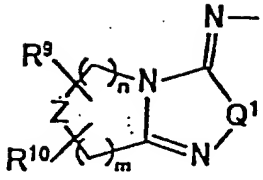
J-11



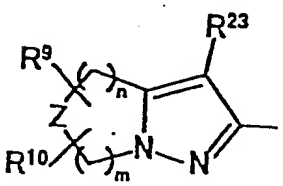
J-12



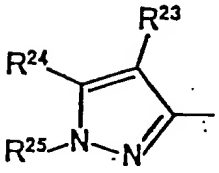
J-13



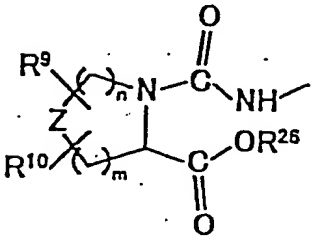
J-14



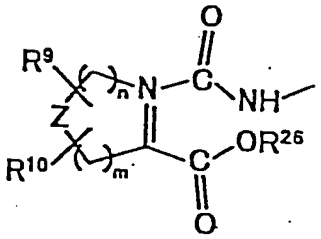
J-15



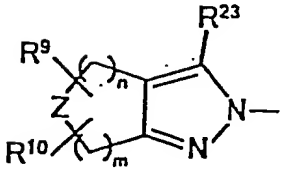
J-16



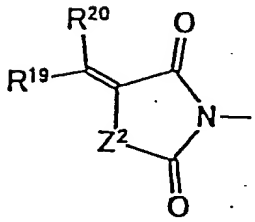
J-17



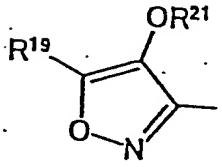
J-18



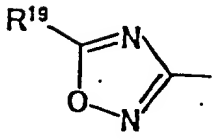
J-19



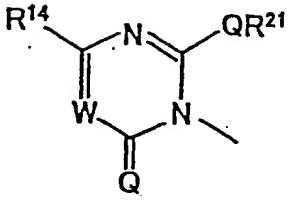
J-20



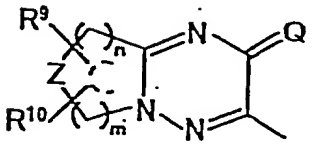
J-21



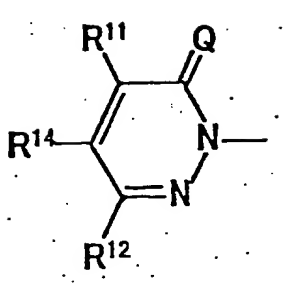
J-22



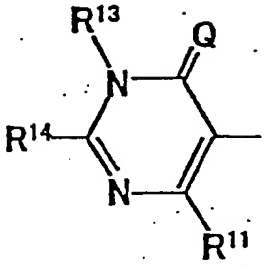
J-23



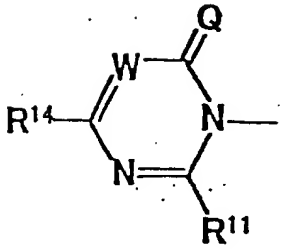
J-24



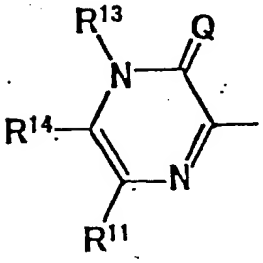
J-25



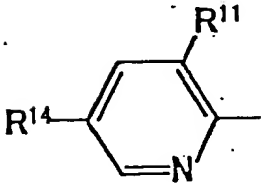
J-26



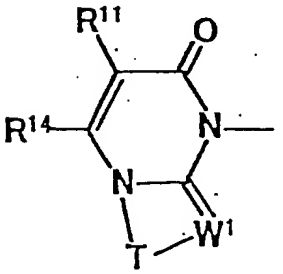
J-27



J-28



J-29



J-30

wherein the dotted lines in the formulas J-5, J-6, J-12 and J-24 represent that the left hand ring contains only single bonds, or one bond in the ring is a double bond between carbon atoms;

X is oxygen atom or sulfur atom;

Y is oxygen atom or sulfur atom;

R1 is hydrogen atom or halogen atom;

R2 is hydrogen atom, C1-C8alkyl group, C1-C8 haloalkyl group, halogen atom, OH group, OR27 group, SH group, S(O)pR27

group, COR27 group, CO2R27 group, C(O)SR27 group, C(O)NR29R30 group, CHO group, CR27=NOR36 group, CH=CR37CO2R27 group, CH2CHR37CO2R27 group, CO2N=CR31R32 group, nitro group, cyano group, NHSO2R33 group, NHSO2NHR33 group, NR27R38 group, NH2 group or phenyl group optionally substituted with one or more and the same or different C1-C4 alkyl groups;

p is 0, 1 or 2;

R3 is C1-C2 alkyl group, C1-C2 haloalkyl group, OCH3 group, SCH3 group, OCHF2 group, halogen atom, cyano group or nitro group;

R4 is hydrogen atom, C1-C3 alkyl group, C1-C3 haloalkyl group or halogen atom;

R5 is hydrogen atom, C1-C3 alkyl group, halogen atom, C1-C3 haloalkyl group, cyclopropyl group, vinyl group, C2 alkynyl group, cyano group, C(O)R38 group, CO2R38 group, C(O)NR38R39 group, CR34R35CN group, CR34R35C(O)R38 group, CR34R35CO2R38 group, CR34R35C(O)NR38R39 group, CHR34OH group, CHR34OC(O)R38 group or OCHR34OC(O)NR38R39 group, or, when G is G-2 or G-6, R4 and R5 may form C=O group together with the carbon atom to which they are attached;

R6 is C1-C6 alkyl group, C1-C6 haloalkyl group, C2-C6 alkoxyalkyl group, C3-C6 alkenyl group or C3-C6 alkynyl group;

X1 is single bond, oxygen atom, sulfur atom, NH group, N(C1-C3 alkyl) group, N(C1-C3 haloalkyl) group or N(allyl) group;

R7 is hydrogen atom, C1-C6 alkyl group, C1-C6 haloalkyl group, halogen atom, S(O)2(C1-C6alkyl) group or C(=O)R40 group;

R8 is hydrogen atom, C1-C8 alkyl group, C3-C8 cycloalkyl group, C3-C8 alkenyl group, C3-C8 alkynyl group, C1-C8 haloalkyl group, C2-C8 alkoxyalkyl group, C3-C8 alkoxyalkoxyalkyl group, C3-C8 haloalkynyl group, C3-C8 haloalkenyl group, C1-C8 alkylsulfonyl group, C1-C8 haloalkylsulfonyl group, C3-C8 alkoxycarbonylalkyl group, S(O)2NH(C1-C8 alkyl) group, C(O)R41 group or benzyl group whose phenyl ring may be substituted with R42;

n and m are independently 0, 1, 2 or 3 and m + n is 2 or 3;

Z is CR9R10 group, oxygen atom, sulfur atom, S(O) group, S(O)2 group or N(C1-C4 alkyl) group;

each R9 is independently hydrogen atom, C1-C3 alkyl group, halogen atom, hydroxyl group, C1-C6 alkoxy group, C1-C6 haloalkyl group, C1-C6 haloalkoxy group, C2-C6 alkylcarbonyloxy group or C2-C6 haloalkylcarbonyloxy group;

each R10 is independently hydrogen atom, C1-C3 alkyl group, hydroxyl group or halogen atom;

R11 and R12 are independently hydrogen atom, halogen atom, C1-C6 alkyl group, C3-C6 alkenyl group or C1-C6 haloalkyl group;

R13 is hydrogen atom, C1-C6 alkyl group, C1-C6 haloalkyl group, C3-C6 alkenyl group, C3-C6 haloalkenyl group, C3-C6 alkynyl group, C3-C6 haloalkynyl group, HC(=O) group, (C1-C4 alkyl)C(=O) group or NH2 group;

R14 is C1-C6 alkyl group, C1-C6 alkylthio group, C1-C6 haloalkyl group or N(CH3)2 group;

W is nitrogen atom or CR15;

R15 is hydrogen atom, C1-C6 alkyl group, halogen atom, or phenyl group optionally substituted with C1-C6 alkyl group, one or two halogen atoms, C1-C6 alkoxy group or CF3 group;

each Q is independently oxygen atom or sulfur atom;

Q1 is oxygen atom or sulfur atom;

Z1 is CR16R17 group, oxygen atom, sulfur atom, S(O) group, S(O)2 group or N(C1-C4alkyl) group;

each R16 is independently hydrogen atom, halogen atom, hydroxyl group, C1-C6 alkoxy group, C1-C6 haloalkyl group, C1-C6 haloalkoxy group, C2-C6 alkylcarbonyloxy group or C2-C6 haloalkylcarbonyloxy group;

each R17 is independently hydrogen atom, hydroxyl group or halogen atom;

R18 is C1-C6 alkyl group, halogen atom or C1-C6 haloalkyl group;

R19 and R20 are independently hydrogen atom, C1-C6 alkyl group, or C1-C6 haloalkyl group;

Z2 is oxygen atom, sulfur atom, NR9 group or CR9R10 group;

R21 and R22 are independently C1-C6 alkyl group, C1-C6 haloalkyl group, C3-C6 alkenyl group, C3-C6 haloalkenyl group, C3-C6 alkynyl group or C3-C6 haloalkynyl group;

R23 is hydrogen atom, halogen atom or cyano group;

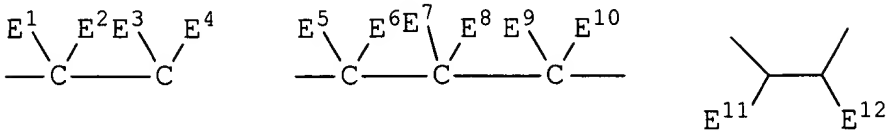
R24 is C1-C6 alkylsulfonyl group, C1-C6 alkyl group, C1-C6 haloalkyl group, C3-C6 alkenyl group, C3-C6 alkynyl group, C1-C6 alkoxy group, C1-C6 haloalkoxy group or halogen atom;

R25 is C1-C6 alkyl group, C1-C6 haloalkyl group, C3-C6 alkenyl group or C3-C6 alkynyl group;

R26 is C1-C6 alkyl group, C1-C6 haloalkyl group or phenyl group optionally substituted with C1-C6 alkyl, one or two halogen atoms, one or two nitro groups, C1-C6 alkoxy group or CF3 group;

W1 is nitrogen atom or CH group;

T is a group represented by any one of the following general formulas T-1, T-2 and T-3;



T-1 T-2 T-3

(wherein E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11 and E12 are independently hydrogen atom or C1-C3 alkyl group);

R27 is C1-C8 alkyl group, C3-C8 cycloalkyl group, C3-C8 alkenyl group, C3-C8alkynyl group, C1-C8 haloalkyl group, C2-C8 alkoxyalkyl group, C2-C8 alkylthioalkyl group, C2-C8 alkylsulfinylalkyl group, C2-C8 alkylsulfonylalkyl group, C1-C8 alkylsulfonyl group, phenylsulfonyl group whose phenyl ring may be substituted with at least one substituent selected from the group consisting of halogen atom and C1-C4 alkyl group, C4-C8 alkoxyalkoxyalkyl group, C4-C8 cycloalkylalkyl group, C6-C8 cycloalkoxyalkyl group, C4-C8 alkenyloxyalkyl group, C4-C8 alkynyloxyalkyl group, C3-C8 haloalkoxyalkyl group, C4-C8 haloalkenyloxyalkyl group, C4-C8 haloalkynyloxyalkyl group, C6-C8 cycloalkylthioalkyl group, C4-C8 alkenylthioalkyl group, C4-C8 alkynylthioalkyl group, C1-C4 alkyl group substituted with phenoxy

group whose ring is substituted with at least one substituent selected from the group consisting of halogen atom, C1-C3 alkyl group and C1-C3 haloalkyl group, benzyloxy group whose ring is substituted with at least one substituent selected from the group consisting of halogen atom, C1-C3 alkyl group and C1-C3 haloalkyl group, C4-C8 trialkylsilylalkyl group, C3-C8 cyanoalkyl group, C3-C8 halocycloalkyl group, C3-C8 haloalkenyl group, C5-C8 alkoxyalkenyl group, C5-C8 haloalkoxyalkenyl group, C5-C8 alkylthioalkenyl group, C3-C8 haloalkynyl group, C5-C8 alkoxyalkynyl group, C5-C8 haloalkoxyalkynyl group, C5-C8 alkylthioalkynyl group, C2-C8 alkylcarbonyl group, benzyl group whose ring is substituted with at least one substituent selected from the group consisting of halogen atom, C1-C3 alkyl group and C1-C3 haloalkyl group, CHR34COR28 group, CHR34COOR28 group, CHR34P(O)(OR28)2 group, CHR34P(S)(OR28)2 group, CHR34C(O)NR29R30 group or CHR34C(O)NH2 group;

R28 is C1-C6 alkyl group, C2-C6 alkenyl group, C3-C6 alkynyl group or tetrahydrofuranyl group;

R29 and R31 are independently hydrogen atom or C1-C4 alkyl group;

R30 and R32 are independently C1-C4 alkyl group or phenyl group whose ring may be substituted with at least one substituent

selected from the group consisting of halogen atom, C1-C3 alkyl group and C1-C3 haloalkyl group; or,

R29 and R30 together may form -(CH2)5-, -(CH2)4- or -CH2CH2OCH2CH2-, or the ring thus formed may be substituted with at least one substituent selected from the group consisting of C1-C3 alkyl group, phenyl group and benzyl group; or,

R31 and R32 may from C3-C8 cycloalkyl group together with the carbon atom to which they are attached;

R33 is C1-C4 alkyl group, C1-C4 haloalkyl group or C3-C6 alkenyl group;

R34 and R35 are independently hydrogen atom or C1-C4 alkyl group;

R36 is hydrogen atom, C1-C6 alkyl group, C3-C6 alkenyl group or C3-C6 alkynyl group;

R37 is hydrogen atom, C1-C4 alkyl group or halogen atom;

R38 is hydrogen atom, C1-C6 alkyl group, C3-C6 cycloalkyl group, C3-C6 alkenyl group, C3-C6 alkynyl group, C2-C6 alkoxyalkyl group, C1-C6 haloalkyl group, phenyl group whose ring may be substituted with at least one substituent selected from the group consisting of halogen atom, C1-C4 alkyl group and C1-C4 alkoxy group, -CH2CO2(C1-C4 alkyl) group or -CH(CH3)CO2(C1-C4 alkyl) group;

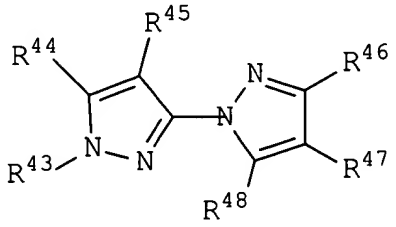
R39 is hydrogen atom, C1-C2 alkyl group or C(O)O(C1-C4 alkyl) group;

R40 is hydrogen atom, C1-C6 alkyl group, C1-C6 alkoxy group or NH(C1-C6 alkyl) group;

R41 is C1-C6 alkyl group, C1-C6 haloalkyl group, C1-C6 alkoxy group, NH(C1-C6 alkyl) group, phenyl group whose ring may be substituted with one substituent selected from the group consisting of R42 group, benzyl group and C2-C8 dialkylamino group; and

R42 is C1-C6 alkyl group, one or two halogen atoms, C1-C6 alkoxy group or CF3 group;

(3) a compound of the formula (II):



or nipilacrofen,

wherein R43 is C1-C4 alkyl group;

R44 is C1-C4 alkyl group, C1-C4 alkylthio group, C1-C4 alkoxy group, C1-C4 haloalkyl group, C1-C4 haloalkylthio group or C1-C4 haloalkoxy group;

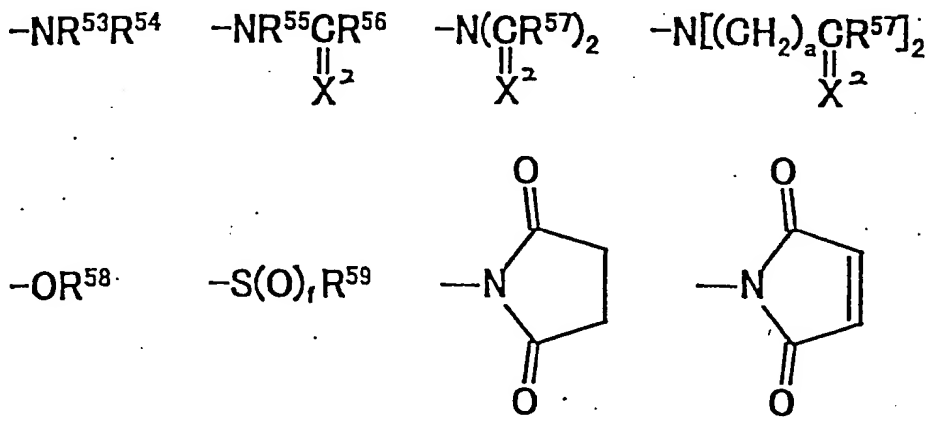
R43 and R44 together may form -(CH2)3- or -(CH2)4-;

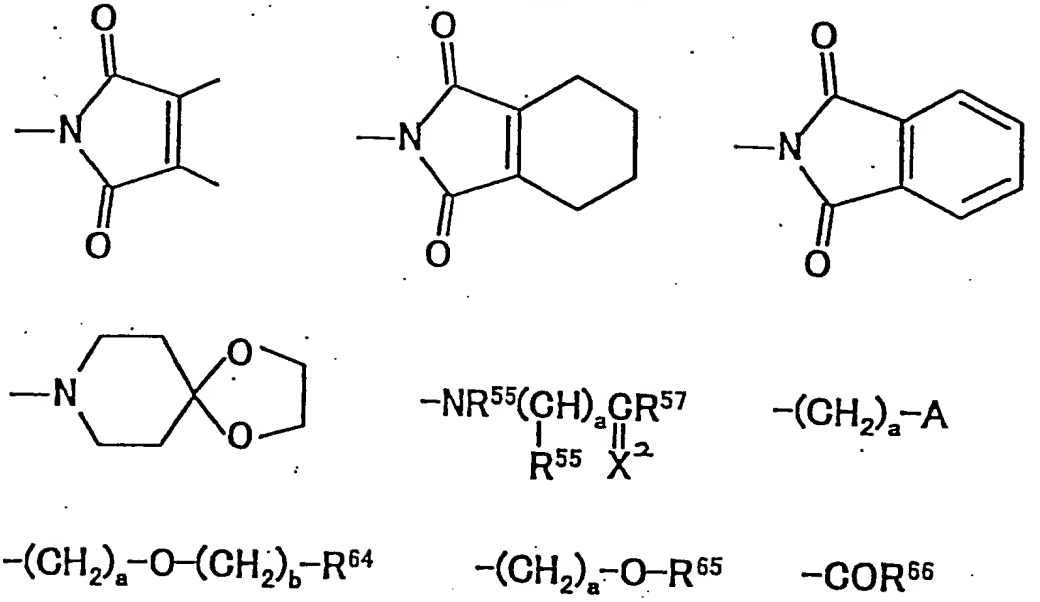
R45 is hydrogen atom or halogen atom;

R46 is hydrogen atom or C1-C4 alkyl group;

R47 is hydrogen atom, nitro group, cyano group, -COOR49 group, -C(=X)NR50R51 group or -C(=X2)R52 group;

R48 is hydrogen atom, halogen atom, cyano group, C1-C4 alkyl group optionally substituted with at least one substituent selected from the group consisting of halogen atom and hydroxyl group, C1-C4 alkoxy group, phenyl group optionally substituted with at least one substituent selected from the group consisting of halogen atom, nitro group, cyano group, C1-C4 alkyl group, C1-C4 alkoxy group and halo-C1-C4 alkyl group, pyrrolyl group, C2-C8 alkyl group, C3-C8 alkenyl group, C3-C8 alkynyl group, C3-C8 alkoxy group, a group selected from the group consisting of C2-C8 alkyl group, C3-C8 alkenyl group, C3-C8 alkynyl group and C3-C8 alkoxy group into which at least one oxygen atom is inserted, or any one of groups represented by the following formulas:





wherein R49, R50 and R52 are, the same or different, hydrogen atom or C1-C4 alkyl group;

R50 and R51 may form saturated alicyclic 5 or 6 membered ring together with the nitrogen atom to which they are attached;

R52 is hydrogen atom, C1-C4 alkyl group or C1-C4 alkyl group substituted with at least one halogen atom;

R53 is hydrogen atom, C1-C4 alkyl group optionally substituted with at least one halogen atom, C2-C6 alkenyl group optionally substituted with at least one halogen atom, C3-C6 alkynyl group optionally substituted with at least one halogen atom, phenyl group optionally substituted with at least one halogen atom, C3-C8 cycloalkyl group, cyanomethyl group, or R63CO- group;

R54 is hydrogen atom, C1-C6 alkyl group optionally substituted with at least one halogen atom, C2-C6 alkenyl group

optionally substituted with at least one halogen atom, C3-C6 alkynyl group optionally substituted with at least one halogen atom, phenyl group optionally substituted with halogen atom, C3-C8 cycloalkyl group, cyanomethyl group, C1-C4 alkoxy-C1-C6 alkyl group, di-C1-C4 alkylamino-C1-C4 alkyl group, tetrahydrofurfurylmethyl group, C3-C6 alkynyloxy-C1-C4 alkyl group, benzyl whose ring may be substituted with substituent selected from the group consisting of halogen atom, nitro group, cyano group, C1-C4 alkyl group, C1-C4 alkoxy group and halo-C1-C4 alkyl group, -C(=X2)R63 group, -(CH2)a-(O)d-R70 group, -(CH2)a-O-(CH2)b-R70 group, -(CH2)a-X2-R76 group;

R53 and R54 together with the nitrogen atom to which they are attached may form saturated alicyclic 3, 5 or 6 membered ring or aromatic 5 or 6 membered ring in which a carbon atom may be optionally replaced with oxygen atom;

R55 is hydrogen atom, C1-C4 alkyl group, C2-C6 alkenyl group or C3-C6 alkynyl group, or R55 and R56 together may form -(CH2)e-;

R56 and R57 are independently C1-C4 alkyl group optionally substituted with at least one halogen atom, C2-C6 alkenyl group optionally substituted with at least one halogen atom, C3-C6 alkynyl optionally substituted with at least one

halogen atom or phenyl group optionally substituted with at least one halogen atom, hydrogen atom, C3-C6 cycloalkyl group, -XR60 group or -NR61R62 group;

R58 is hydrogen atom, C1-C6 alkyl group, C2-C6 alkenyl group, C3-C6 alkynyl group, C1-C4 alkylcarbonyl group, cyano-C1-C3 alkyl group, C1-C4 alkoxycarbonyl-C1-C4 alkyl group, di-C1-C4 alkoxycarbonyl-C1-C4 alkyl group, benzyl group, C1-C4 alkoxy-C1-C4 alkynyl group, -(CH2)a-R75 group, -(CH2)a-X2-R72 group, -(CH2)a-X2-(CH2)b-R72 group or -(CH2)a-X2-(CH2)b-X2-(CH2)c-R72 group;

R59 is hydrogen atom, C1-C4 alkyl group, C2-C6 alkenyl group, C3-C6 alkynyl group, cyano-C1-C3 alkyl group, C1-C4 alkylcarbonyl-C1-C3 alkyl group or phenyl group;

R60 is C1-C4 alkyl group optionally substituted with at least one halogen atom;

R61 and R62 are, the same or different, hydrogen atom or C1-C4 alkyl group;

R63 is C1-C4 alkyl group optionally substituted with at least one halogen atom, C1-C4 alkoxy-C1-C4 alkyl group, C1-C4 alkylthio-C1-C4 alkyl group, C3-C6 cycloalkyl group, phenyl group whose ring may be substituted with one substituent selected from the group consisting of halogen atom, nitro group, cyano group, C1-

C4 alkyl group, C1-C4 alkoxy group and halo-C1-C4 alkyl group, -NR73R74 group or -(CH2)a-(O)d-R75 group;

R64 is C1-C4 alkoxycarbonyl group or carboxyl group;

R65 is chloromethyl group, cyanomethyl group, C3-C6 cycloalkyl group into which at least one oxygen atom may be inserted, or C1-C4 alkoxycarbonyl-C1-C4 alkyl group;

R66 is hydroxyl group or -NR67R68 group;

A is -NR67R68 group or -S(O)f-R69 group;

R67 and R68 are, the same or different, hydrogen atom or C1-C4 alkyl group;

R69 is C1-C4 alkyl group or C1-C4 haloalkyl group;

R70 is hydrogen atom, hydroxyl group, halogen atom, C1-C4 alkyl group optionally substituted with at least one C1-C4 alkoxy group, C3-C6 cycloalkyl group into which at least one oxygen atom may be inserted, C3-C6 cycloalkyl group optionally substituted with one or two methyl groups, furyl group, thienyl group or -C(=O)R71 group;

R71 and R72 are, the same or different, C1-C4 alkyl group or C1-C4 alkoxy group;

R73 and R74 are, the same or different, C1-C4 alkyl group or phenyl group;

R75 is C3-C6 cycloalkyl into which at least one oxygen atom may be inserted, C3-C6 cycloalkyl group optionally substituted with one or two methyl groups, furyl group, thienyl group or -C(=O)R71 group;

R76 is C1-C4 alkyl group;

a, b and c is independently 1, 2 or 3;

d is 0 or 1;

e is 2 or 3;

f is 1 or 2; and

X2 is oxygen atom or sulfur atom.

~~52.~~ The method according to the above ~~1~~, additionally comprising the steps of:

introducing into the plant cell, a second gene selected from a gene encoding a protein substantially having protoporphyrinogen oxidase activity, a gene encoding a protein substantially having 5-enolpyruvylshikamate-3-phosphate synthase activity and a gene encoding a protein substantially having glyphosate oxidoreductase activity; and

expressing said second gene.

Another aspect of the present invention relates to a ~~53. A~~ plant cell having:

a gene encoding a protein having the following characteristics (a) to (c):

(a) having a specific affinity for a substance which is concerned with the weed control activity of a weed control compound,

(b) having substantially no capability of modifying a substance for which said protein has a specific affinity, and

(c) being substantially free from framework regions of variable regions in an immunoglobulin; and

at least one altered form of an enzymatic activity which gives a resistance to a weed control compound in an amount inhibiting a naturally occurring form of said enzymatic activity, wherein said altered form of an enzymatic activity is a form of enzymatic activity selected from a protoporphyrinogen oxidase activity, 5-enolpyruvylshikamate-3-phosphate synthase activity and glyphosate oxidoreductase activity.

Another aspect of the present invention relates to a ~~54. A~~ plant cell having:

a gene encoding a protein having the following characteristics (a) to (c):

(a) having a specific affinity for a substance which is concerned with the weed control activity of a weed control compound,

(b) having substantially no capability of modifying a substance for which said protein has a specific affinity, and

(c) being substantially free from framework regions of variable regions in an immunoglobulin; and

an altered protoporphyrinogen oxidase activity which gives a resistance to a weed control compound in an amount inhibiting a natural occurring protoporphyrinogen oxidase activity.

Another aspect of the present invention relates to a ~~55. A~~ plant cell having:

a gene encoding a protein having the following characteristics (a) to (c):

(a) having a specific affinity for a substance which is concerned with the weed control activity of a weed control compound,

(b) having substantially no capability of modifying a substance for which said protein has a specific affinity, and

(c) being substantially free from framework regions of variable regions in an immunoglobulin; and

an altered 5-enolpyruvylshikamate-3-phosphate synthase activity which gives a resistance to a weed control compound in an amount inhibiting a natural occurring 5-enolpyruvylshikamate-3-phosphate synthase activity.

Another aspect of the present invention relates to a ~~56. A~~ plant cell having:

a gene encoding a protein having the following characteristics (a) to (c):

(a) having a specific affinity for a substance which is concerned with the weed control activity of a weed control compound,

(b) having substantially no capability of modifying a substance for which said protein has a specific affinity, and

(c) being substantially free from framework regions of variable regions in an immunoglobulin; and

an altered glyphosate oxidoreductase activity which gives a resistance to a weed control compound in an amount inhibiting a natural occurring glyphosate oxidoreductase activity.

~~57.~~ The present invention also relates to the plant cell according to the above ~~53~~, wherein said altered form of an enzymatic activity is conferred by a second gene selected from a gene encoding a protein substantially having a protoporphyrinogen

oxidase activity, a gene encoding a protein substantially having 5-enolpyruvylshikamate-3-phosphate synthase activity and a gene encoding a protein substantially having glyphosate oxidoreductase activity;~~.~~

~~58.~~ The plant cell according to the above ~~57~~, wherein the gene encoding a protein having the following characteristics (a) to (c):

(a) having a specific affinity for a substance which is concerned with the weed control activity of a weed control compound,

(b) having substantially no capability of modifying a substance for which said protein has a specific affinity, and

(c) being substantially free from framework regions of variable regions in an immunoglobulin; and

the second gene are introduced into the plant cell in the form in that both of said genes are operably ligated to a promoter and a terminator both of which are functional in said plant cell;~~.~~

~~59.~~ The plant cell according to the above ~~57~~, wherein the protein substantially having a proto-porphyrinogen IX oxidase activity is protoporphyrinogen IX oxidase, the protein substantially having a 5-enol-pyruvylshikamate-3-phosphate synthase activity is 5-enolpyruvylshikamate-3-phosphate synthase and the

protein substantially having glyphosate oxidoreductase activity is glyphosate oxidoreductase;

60. The plant cell according to the above 53, wherein the plant cell is derived from dicotyledones or monocotyledones;

61. A plant comprising the plant cell of the above 54;

62. A plant comprising the plant cell of the above 55.

63. A plant comprising the plant cell of the above 56.

64. A method for protecting a plant which comprises applying a protoporphyrinogen IX oxidase inhibitory-type compound to a growth area of the plant of the above 61;

65. A method for protecting a plant which comprises applying a protoporphyrinogen IX oxidase inhibitory-type compound and a compound inhibiting 5-enolpyruvylshikamate-3-phosphate synthase to a growth area of the plant of the above 62;

66. A method for protecting a plant which comprises applying a protoporphyrinogen IX oxidase inhibitory-type compound and a compound inhibiting 5-enolpyruvylshikamate-3-phosphate synthase to a growth area of the plant of the above 63;

67. A method for selecting a plant which comprises applying a protoporphyrinogen IX oxidase inhibitory-type compound to a growth area of the plant of the above 61 and other plants, and selecting

either plant on the basis of difference in growth between the plants;~~.~~

~~68.~~ A method for selecting a plant which comprises applying a protoporphyrinogen IX oxidase inhibitory-type compound and a compound inhibiting 5-enolpyruvylshikamate-3-phosphate synthase to a growth area of the plant of the above ~~62~~ and other plants, and selecting either plant on the basis of difference in growth between the plants; and~~.~~

~~69.~~ A method for selecting a plant which comprises applying a protoporphyrinogen IX oxidase inhibitory-type compound and a compound inhibiting 5-enolpyruvylshikamate-3-phosphate synthase to a growth area of the plant of the above ~~63~~ and other plants, and selecting either plant on the basis of difference in growth between the plants.